

## CLAIMS

What is claimed is:

1. A method of detecting a radial tilt of a disc, the method comprising:  
comparing phases of first summed signals obtained from a first plurality of signals that external light-receiving units of a photo diode receive to generate an external phase comparison signal ;  
comparing phases of second summed signals obtained from a second plurality of signals that internal light-receiving units of the photo diode receive to generate an internal phase comparison signal ; and  
detecting the radial tilt based on the internal and external phase comparison signals obtained when a laser beam crosses a track on the disc.
2. The method of claim 1, wherein the detecting of the radial tilt comprises reading a level value of the internal phase comparison signal when a level value of the external phase comparison signal is substantially zero.
3. The method of claim 2, wherein the detecting of the radial tilt comprises multiplying the read value by a proportional constant .
4. The method of claim 1, wherein the internal and external light-receiving units are substantially rectangular, two sides of light-receiving surfaces of the internal light-receiving units and two sides of light-receiving surfaces of the external light-receiving units disposed in a track direction of the disc are substantially identical, and the other two sides of the light-receiving surfaces of the external light-receiving units disposed to be substantially perpendicular to the track direction of the disc are longer than the other two sides of the light-receiving surfaces of the internal light-receiving units disposed to be substantially perpendicular to the track direction of the disc.
5. The method of claim 1, wherein the second plurality of signals that internal light-receiving units receive to generate the internal phase comparison signal are portions of  $-1^{\text{st}}$ -order and  $1^{\text{st}}$ -order beams of light .

6. The method of claim 5, wherein the first plurality of signals the external light-receiving units receive to generate the external phase comparison signal are a 0<sup>th</sup>-order beam of light and one of -1<sup>st</sup>-order and 1<sup>st</sup>-order beams of light.

7. An apparatus detecting a radial tilt of a disc, the apparatus comprising:  
a pickup unit in which an octant photo diode is mounted;  
a phase comparator comparing phases of first summed signals obtained from a first plurality of signals that external light-receiving units of the octant photo diode receive and generating an external phase comparison signal, and comparing phases of second summed signals obtained from a second plurality of signals that internal light-receiving units of the octant photo diode receive and generating an internal phase comparison signal ; and  
a tilt detector detecting the radial tilt when a laser beam crosses a track on a disc, based on the internal and external phase comparison signals generated by the phase comparator.

8. The apparatus of claim 7, wherein the tilt detector reads a level value Rs of the internal phase comparison signal when a level value of the external phase comparison signal is substantially zero.

9. The apparatus of claim 8, wherein the tilt detector multiplies the read value Rs by a proportional constant calculating a radial tilt value.

10. The apparatus of claim 7, wherein the internal and external light-receiving units are substantially rectangular, two sides of light-receiving surfaces of the internal light-receiving units and two sides of light-receiving surfaces of the external light-receiving units disposed in a track direction of the disc are substantially identical, and the other two sides of the light-receiving surfaces of the external light-receiving units that are disposed to be substantially perpendicular to the track direction of the disc are longer than the other two sides of the light-receiving surfaces of the internal light-receiving units that are disposed to be substantially perpendicular to the track direction of the disc.

11. The apparatus of claim 7, wherein the second plurality of signals the internal light-receiving units receive to generate the internal phase comparison signal are portions of – 1<sup>st</sup>-order and 1<sup>st</sup>-order beams of light .

12. The apparatus of claim 11, wherein the first plurality of signals that external light-receiving units receive to generate the external phase comparison signal are a 0th-order beam of light and one of –1<sup>st</sup>-order and 1<sup>st</sup>-order beams of light.

13. A disc drive apparatus to drive and control tilt of a disc, comprising:  
a drive unit to rotate the disc;  
a pickup unit in which an octant photo diode is mounted;  
a focusing and seek servo control system to move a laser beam spot to a target track on the disc;  
a rotating servo control system to control the rotation of the disc;  
a tracking servo control system to move the laser beam spot to follow the target track during the rotation of the disc; and  
a tilt detector unit, wherein the tilt detector unit comprises:  
a phase comparator comparing phases of first summed signals obtained from a first plurality of signals that external light-receiving units of the octant photo diode receive and generating an external phase comparison signal, and comparing phases of second summed signals obtained from a second plurality of signals that internal light-receiving units of the octant photo diode receive and generating an internal phase comparison signal, and  
a tilt detector detecting the radial tilt when a laser beam crosses a track on the disc based on the internal and external phase comparison signals generated by the phase comparator.

14. A disc recording/reproducing apparatus, comprising:  
at least one of a recording part to record data on a disc and a reproducing part to reproduce data that had been recorded on a disc;  
a mounting fixture to mount a disc drive;

a connector to provide a path for the data from the mounted disc to the at least one of recording part and reproducing part; and

a disc drive mounted in the mounting fixture, wherein the disc drive comprises:

a drive unit to rotate the disc;

a pickup unit in which an octant photo diode is mounted;

a focusing and seek servo control system to move a laser beam spot to a target track on the disc;

a rotating servo control system to control the rotation of the disc;

a tracking servo control system to move the laser beam spot to follow the target track during the rotation of the disc; and

a tilt detector unit, wherein the tilt detector unit comprises:

a phase comparator comparing phases of first summed signals obtained from a first plurality of signals that external light-receiving units of the octant photo diode receive and generating an external phase comparison signal, and comparing phases of second summed signals obtained from a second plurality of signals that internal light-receiving units of the octant photo diode receive and generating an internal phase comparison signal, and

a tilt detector detecting the radial tilt when a laser beam crosses a track on the disc based on the internal and external phase comparison signals generated by the phase comparator.

15. A method of detecting a radial tilt of a disc, comprising:

summing a plurality of signals received when a laser beam crosses a disc;

comparing phases of the summed signals; and

analyzing the compared phases and detecting a tilt.

16. A tilt detecting apparatus, comprising:

a photodiode with a plurality of sectors;

a phase comparator comparing phases of signals received by the plurality of sectors of the photodiode; and

a tilt detector analyzing the compared phases of signals.

17. A computer readable medium encoded with processing instructions implementing a method of detecting a radial tilt of a disc, the method comprising:

comparing phases of first summed signals obtained from a first plurality of signals that external light-receiving units of a photo diode receive to generate an external phase comparison signal;

comparing phases of second summed signals obtained from a second plurality of signals that internal light-receiving units of the photo diode receive to generate an internal phase comparison signal; and

detecting the radial tilt based on the internal and external phase comparison signals obtained when a laser beam crosses a track on the disc.

18. The computer readable medium, as set forth in claim 17, wherein the method of detecting the radial tilt comprises reading a level value of the internal phase comparison signal when a level value of the external phase comparison signal is substantially zero.

19. The computer readable medium as set forth in claim 18, wherein the method of detecting the radial tilt comprises multiplying the read value by a proportional constant.